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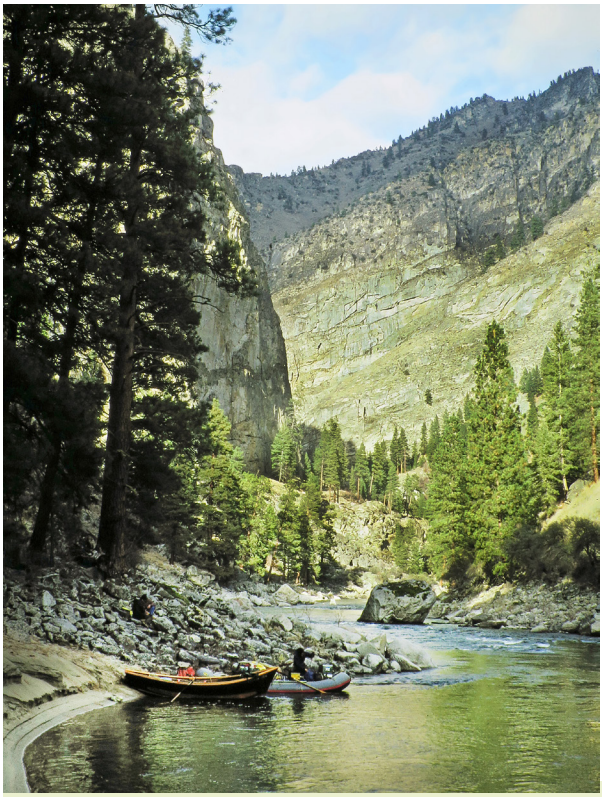
Rethinking the Possible: Applying Long-Term Datasets to Estimate Historic Salmon Abundance in the Middle Fork Salmon River

Looking into the past can help biologists and managers determine what is possible in the future. New research is helping understand the past and more accurately estimate future salmon recovery potential. Central Idaho's Middle Fork Salmon River (MFSR) offers a glimpse of historical Chinook salmon (*Oncorhynchus tshawytscha*) spawning and rearing habitat. The MFSR flows through the Frank Church River of No Return Wilderness, where natural processes remain intact and human influences are minimal. "It's a very unique system that supports critical habitat for many native species," says Russ Thurow, a Research Fisheries Scientist with the USDA Forest Service Rocky Mountain Research Station, who has worked in this river basin since the 1980s.



Because of its wilderness condition, the Middle Fork Salmon River offers a glimpse of historical Chinook salmon natal habitat. The processes that have shaped this landscape for eons remain intact, and human influences are minimal. (photo: Jim Brock).

Each female salmon digs one nest (redd) to deposit eggs. Therefore, estimates of adult salmon numbers can be calculated by multiplying redds times two. Since 1957, the Idaho Department of Fish and Game (IDFG) has consistently counted redds within index areas of six MFSR tributaries. In 1995, Thurow began a continuous redd survey of all remaining MFSR spawning areas not counted by collaborating biologists with the IDFG, Shoshone-Bannock and Nez-Perce Tribes, and Payette, Boise, and Salmon-Challis National Forests.

"The census now extends for 25 years and is spatially robust because we map individual redds," Thurow explains. "These data allow us to examine a variety of research questions, including how populations expand and contract."

Severe declines in salmon populations occurred in the late 1960s–1970s after completion of eight dams on the Snake and Columbia Rivers. Information regarding MFSR populations prior to this was incomplete. The invaluable index and continuous redd datasets enabled Thurow, Tim Copeland (IDFG), and Bryce Oldemeyer (Henry's Fork Foundation) to estimate potential Chinook salmon production in the 1950s–1960s.

How many salmon were there?

The team used contemporary redd census and spawn timing data to calculate how many redds would have been counted historically by expanding the timeframes and spatial extent of archival, index counts. Their analysis revealed the MFSR supported a conservative estimate of 24,000 redds or 48,000 adult Chinook salmon during the 1950s–1960s. For the past 25 years, salmon populations in the MFSR have averaged < 1,500 adults, about 3 percent of the historical

estimate, which may be 30 percent of populations in the 1880s, prior to commercial fishing. In 2019, 322 salmon returned to spawn, about 0.7 percent of 1950s–1960s abundances.

Notably, several contemporary management goals underestimate historical potential. For example, the National Marine Fisheries Service "minimum viable abundance" goal is 10.4 percent of the estimated 48,000 salmon potential. These low goals suggested to the authors that managers were influenced by the shifting baseline syndrome (SBS).

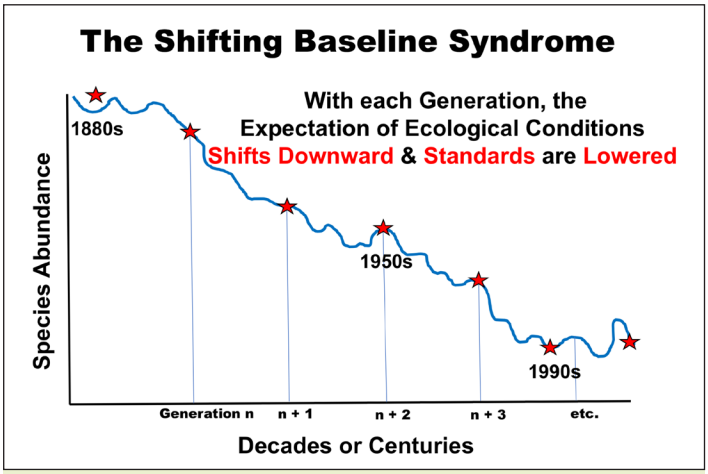
Overcoming the shifting baseline syndrome

Marine biologist Daniel Pauley postulated the SBS in 1995. He suggested that each generation accepts current fish populations and environmental conditions as the baseline. As fish stocks decline, the baseline shifts downward, accommodating more declines and lower reference points. "It's something we humans tend to do," Thurow says. "We believe what we are experiencing today is close to what is possible, when it may actually be a long way from true potential. This research helps suppress the SBS by providing more accurate reference points for managers to consider."

KEY MANAGEMENT CONSIDERATIONS

- By combining archival "index" redd counts with a contemporary redd census and spawn timing data, researchers conservatively estimated that the Middle Fork Salmon River historically supported a potential 24,000 redds or 48,000 adult Chinook salmon.
- Several contemporary management goals are fractions of the 1950s–1960s estimated potential. For example, the National Marine Fisheries Service "minimum viable abundance" goal is 10.4 percent of the estimated 48,000 salmon potential. Such underestimated goals suggest that managers were influenced by the shifting baseline syndrome (SBS).
- This work suppresses the SBS by improving estimates of salmon population potential and by providing more accurate reference points for managers to consider in planning recovery efforts.
- Chinook salmon production in the Middle Fork Salmon River was historically high and it remains high because the basin retains critical building blocks for salmon recovery. The primary factors limiting recovery of its Chinook salmon populations occur outside natal habitats. Recovery is biologically feasible, provided effective actions are implemented to address outside-basin factors.

Their research also confirms that salmon production in the MFSR was historically high and remains high. The basin retains critical building blocks for salmon recovery, including its quality habitat and salmon with high life history diversity, genetic diversity, and demonstrated resiliency. The primary factors limiting recovery of MFSR salmon populations occur outside these exceptional spawning and rearing habitats. Thurow considers it biologically feasible to rebuild MFSR Chinook salmon to 1950s–1960s abundances, provided effective actions are taken to address outside-basin factors and improve survival of salmon after they migrate from the MFSR.



The shifting baseline syndrome occurs as each human generation fails to understand historical abundances and conditions because it incorrectly considers current conditions to be the baseline. When this thinking persists, recovery goals may be far lower than true system potential (graphic: R. Thurow, USDA Forest Service, based on Pauly, 1995).

PROJECT LEAD

Russ Thurow is a Research Fisheries Scientist with the USDA Forest Service, Rocky Mountain Research Station. His research focuses on understanding ecosystem function and aquatic species responses and on development of conservation and restoration strategies for native salmon and trout. Connect with Thurow at www.fs.usda.gov/rmrs/people/rthurow.

FURTHER READING

Pauly, D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. Trends in Ecology and Evolution. 10:430.

Thurow, R.F.; Copeland, T.; Oldemeyer, B.N.. 2019. Wild salmon and the shifting baseline syndrome: application of archival and contemporary redd counts to estimate historical Chinook salmon (*Oncorhynchus tshawytscha*) production potential in the Central Idaho wilderness. Canadian Journal of Fisheries and Aquatic Sciences.

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